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Science and the Public Values

*SCIENCE AND THE PROBLEM OF VALUES**

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By evolutionary time standards, the fate of life on our planet has suddenly, and quite abruptly, come to rest on an entirely new form of security and control, based on the machinery of the human brain. The older, noncognitive controls of nature that have regulated events in our biosphere for hundreds of millions of years, the forces of nature that lifted life from the inorganic to the human level and created man, are no longer in command. Modern man has intervened and now superimposes on nature his own cognitive brand of global domination. The outstanding feature of our times is the occurrence of this radical shift in biospheric controls away from the vast interwoven matrix of pluralistic, time-tested checks and balances of nature, to the much more arbitrary, monistic, and relatively untested mental capacities and impulses of the human brain.

Along with its weaknesses our newly imposed human system of global regulation also contains tremendous new powers, including the potential to effect changes within a decade that formerly required thousands and millions of years. Almost the entire fabric of the earth's surface, from the atomic to the scenic level, is rapidly becoming subject to disassembly and resynthesis along new patterns of human design. In all this human-directed supervision the potential for utopian advancement throughout the globe seems endless. It is important that these utopian potentialities be recognized and remembered as we turn now to consider the other side of the coin.

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Disaster Trends: A Root Cause

Despite the beneficial features of human domination, it becomes increasingly apparent that our biosphere is set today on a disaster course as a direct consequence of human intervention. The entire grand design of life, painstakingly evolved over millennia, suddenly is subject to instant destruction, depending only on some passing twist in human affairs. If nuclear extermination is avoided, other inbuilt, self-destruct features are evident that threaten to bring all civilization to a halt—if things continue as they are going [1, 2].

Some modern analysts are inclined to put the blame for the mounting world crises primarily on excessive population; others blame science and technology; some point to creeping materialism and the pursuit of economic gain and to the loss of faith and of moral values; communists accuse capitalism, and vice versa; some emphasize racism and intolerance; others deplore dysgenic trends in the population. Some blame the young; others, the old. Of course, there always is politics; and in the United States we still have the Indochina war. While the apparent causes are multiple, complex, and confusing at the political, economic, and social levels of analysis, a common root source of dysfunction can be seen when the situation is viewed more objectively through the broad perspectives of evolution and the life and behavioral sciences. In short, if we could summon an extraterrestrial troubleshooter to examine our earthly predicament with an outer-space perspective free of human bias, I believe he very quickly would put his finger on the human value factor in our biospheric controls as the primary underlying cause of most of our difficulties.

In other words, his examination would show that the trends toward disaster in today's world stem mainly from the fact that while man has been acquiring new, almost godlike, powers of control over nature, he has continued to wield these same powers with a relatively shortsighted, most ungodlike set of values, rooted, on the one hand, in outdated biologic hangovers from evolution in the Stone Age and, on the other, in various mythologies and ideologies based on little more than faith, fantasy, and intuition. The obvious recommendation is to shape up our value systems to something more in tune with reality and more properly suited to the new powers that man now commands. It might further be added that any attempt to attack directly the overt symptoms of our global condition—pollution, poverty, aggression, overpopulation, and so on—can hardly succeed until the

requisite changes are first achieved in the underlying human values involved. Once the subjective value factor has been adjusted, corrections will follow readily in the more concrete features of the system.

The reasoning behind these blunt statements is more lengthy: At the outset let it be taken for granted that a reciprocal causal interaction exists between values and related technological, economic, and social conditions. Our subjective values, that is, not only *reflect* environmental conditions but also *produce and control* them. Any complex cycle, spiral, or four-dimensional latticework of causal interactions, like that involving human values and environmental conditions, can be interrupted and shaped from numerous points in the system. Why, then, the selective focus on the value factor; why single out this particular feature of the total causal complex as the one where corrective change is most needed, and the one where remedial effort would be most strategically directed? The answers are complex and call for an objective understanding of the basis of human values, their origins and structure, and particularly for a more widespread recognition of the critical role that values play as causal agents in the biospheric chain of control.

The human brain is today the dominant control force on our planet; what moves and directs the brain of man will, in turn, largely determine the future from here on. Among that vast complex of forces that influence and control the brain and behavior of man, the factor of human values stands out as a universal determinant of all human decisions and actions. Every voluntary act and/or decision by an individual or a group inevitably is governed, overtly or implicitly, by value priorities. In essence, what a person or a society values determines what it does. The human value factor, defined in this way and viewed objectively in terms of brain states that govern acts, thoughts, and decisions, may be seen to occupy a central position of strategic regulative influence in the total biospheric scheme of command.

One can agree with those who claim that excess population is the principal potentiating factor behind a large majority of today's problems. Yet, behind the population surplus one sees always the determining factor of human values with which it is necessary to cope first to attain any effective control over human procreation. The same reasoning will be found to apply to other major threats like pollution, poverty, war, and nuclear escalation.

What man does to his world will be determined very largely by the

subjective values and beliefs by which he lives and is moved and guided. As human numbers increase and as science and technology grow ever more powerful, the greater will become the strategic control of the human value factor that determines how all of this growing human power will be applied and directed. Simple logic says that future alterations in this single factor alone could spell the difference between utopia and social disaster. Viewed objectively as top-level causal agents in our global-control system, human values have become too important to be treated, as in the past, simply by neglect or by a laissez-faire or even "hands-off" policy. The new conditions call for a new concern and a new approach.

The current widespread rejection and breakdown of the mainline value and belief systems by which civilized man has lived for centuries have additionally amplified in recent years the need for constructive adjustment in the value factor as such. While the "God is dead" and related movements of the past decade have resulted in considerable searching for and testing of new values and new life styles, these groping efforts have not yet succeeded in replacing the old discarded guidelines with new ones, at least not on any scale sufficient to be socially effective. With this gap unfilled, large segments of civilized society drift today in a state of confusion, at a loss with regard to ethical standards, morality, goals, and sense of purpose and direction in the human endeavor generally.

When the Society for Zero Population Growth squares off against the church on issues of abortion, birth control, optimal population, and related questions, by what ultimate standards do we decide who is in the right? Similarly, when other opposing factions come to fundamental philosophic disagreement on issues like justifiable military killing, human exploitation of other species, eugenics, euthanasia, plunder of natural resources, noble savagery versus the urban rat race, redwoods versus freeways, and all the multitude of other value questions that now confront us, by what ultimates do we attempt to distinguish right from wrong? Our tolerant, educated Western societies, in particular, seem more and more to be lacking in conviction with regard to any kind of ultimate standards.

Societal values tend to be self-corrective to a large degree and to change naturally in response to changing needs and conditions, but in these days of extremely rapid change the time lag is defeative. By the time a voting majority becomes ready to recognize and endorse new values, as it now seems to be doing with respect to pollution and

overpopulation, the situation will already have advanced far beyond the state of the optimal ideal toward a condition of intolerability. As long as values are formed on this feedback basis, social existence will continue to fluctuate around levels of survival and tolerability rather than those of any ideal. Wherever possible, it is therefore preferable that value developments precede and help control, rather than follow, changes in social conditions. In this same connection there is good basis for concluding that the human brain, with its advanced cognitive capabilities, does better to seek its values above the natural, immediate, situational level in more rational, long-term, and idealistic realms.

For these and reasons to follow it seems important that the social value factor be more generally recognized as a powerful causal agent in its own right and something to be dealt with directly as such. No more critical task can be projected for the 1970s than that of seeking for civilized society a new, elevated set of value guidelines more suited to man's expanding numbers and new powers over nature, a frame of reference for value priorities that will act to secure and conserve our world instead of destroying it. The way to one possible answer can be seen broadly to lie in a fusion of science, ethics, and religion that would bring the insight, knowledge, and principles of science to bear upon the whole problem of values and value priorities. There is need for what might almost be called a science of values.

This, with what follows, is only a point of view that emerges from my work and personal experiences in the mind-brain and related life sciences. No claim can be made for its originality or sophistication with respect to existent literature in the wide spectrum of the humanities involved. Mainly, it constitutes an explanatory enlargement and defense of an earlier contention [3] regarding the feasibility of a science of values.

At first thought values may appear to be entirely impossible to treat on any rational, logical, or scientific basis. Human values, as a reflection of man's beliefs, wants, needs, and ideology as well as of more concrete biological and situational conditions are subjective and often irrational. More than this, the basic values of a people are tied in closely with their religious beliefs and with "inalienable" personal and civil rights, freedom, and the like. Thus, in the minds of most of us, they tend to acquire a kind of inviolate sacred primacy that makes them immune to any deliberate analysis and corrective alteration for other ends. In the latter sense, the human value factor has been not

only neglected or treated only indirectly but often pointedly bypassed by policy in efforts to deal with social problems.

Traditional Views on "Science versus Values" Are Obsolete

Resistance to a scientific approach to values stems further from the traditional dictum that value questions, by nature, lie out of bounds for science. Many of us have been raised on pronouncements like the following: "Value judgments lie outside the realm of science." "Science may tell us *how,* but not *why.*" "Science can tell us how to achieve a given goal but cannot tell us for which goals to aim." Thus, on the one hand, we have human values as the paramount problem of our time; on the other, we have science as the proven "number 1" method available for obtaining answers and the kind of validity on which values should be based. Paradoxically, we are taught that the two belong in separate realms and that the one must not be applied to the other.

Unable to accept the basis for this traditional separation of science and values, I have long leaned toward the diametric opposite: namely, that science and values are quite miscible; that a scientific approach to values is both feasible and desirable; and, further, that the best source for social values is found through the avenues of science. This derives in part from a conviction that the functional organization of our cerebral machinery is inherently such that the scientific method offers the most reliable means by which a brain can arrive at an operationally valid stance in the realm of values, as well as elsewhere.

The feasibility, or desirability, of attempting to bring science to apply to the problem of values will continue to require justification on many counts. Formal religious doctrine traditionally has set the foundations for civilized man's ultimate values—the top values, that is, that are the final referents behind the systems of subsidiary values that comprise the daily "good life" of whatever one's faith may be. The mere thought of exposing these spiritual and sacred ultimates to the open scrutiny, analysis, and manipulative empiricism of science may cause a shudder in many quarters. I will try to show below that fears along these lines can be largely dispelled.

Through progressive undermining of sacred dogma, science long has been regarded more as archenemy than ally of religion and related values. In addition, society seems increasingly inclined today to look to the spirit of antiscience rather than to science for its solutions. Science and technology stand accused of having created many of the

crisis problems that now confront us. For our present argument it is important to recognize that science is being blamed here not because it has failed but, on the contrary, because it has succeeded so well. What has failed is not science but rather the value and belief systems of man that have determined the way in which his scientific advances have been applied.

It is a traditional argument that science and the scientific method involve objective measurements of cold, value-free, quantitative aspects of phenomena and therefore are inherently not qualified to deal with values. This argument may have had some philosophic validity in the past with reference to the physical sciences, but it fails to take into account the content, principles and phenomena of the behavioral and life sciences as developed today. Modern behavioral science deals directly with value preferences and their formation as important causal variables in behavior, and it also deals with goals, needs, motivation, and related factors at individual, group, and social levels. Contrary to the traditional view, the origin, development, and causal role of values now are very much a part of science.

A related argument would keep science and values separate on the assertion that values are subjective mental phenomena and thus inaccessible to science. This dualistic logic also is no longer applicable. Current theory of mind leads to a quite different philosophy regarding the relation of objective science to subjective experience. Mental awareness no longer need be set off in a separate metaphysical, epiphenomenal, or other parallelistic or dualistic realm [3, 4]. Subjective values, like other mental phenomena, become an integral part of the objective brain process with top-level control potency in the sequence of causation in man's decision-making machinery. In these current terms, subjective values can be treated in principle as causal agents in the objective world and very much a legitimate concern of objective science.

Another old argument holds that the scope of science is inadequate to be of much help with questions concerning the ultimate goals and meaning of existence with which religion deals and which largely set the basic parameters for social values. This gap between religion and science has been largely erased by modern advances in our concepts of cosmology, of the nature of matter, of the forces that move the universe and created life, and of the nature of mind and the mind-brain relation. All these advanced insights make science today highly rele-

vant and directly competitive in scope with revelation, faith, and intuition.

Clearly, many of the traditional reasons for discounting a scientific approach to values do not hold up under examination today. Certain aspects of values, however, will continue to pose difficulties for science. On examination these remaining difficulties are found to apply as well to the alternative sources of social values like intuition, common sense, or revelation, or to political, legal, or economic philosophy. Society does have to get its values somewhere, and at present it seems a fair statement that man has no guidelines for obtaining social values that are superior to those of science. More than intuition —and just as much as politics, economics, law, or other disciplines, including philosophy and religion—science deals with ultimates.

Toward a Theory of Values

If objections in principle can be removed and the way formally cleared for an open application of science in the realm of values, the question remains as to whether any significant practical progress can be expected. Perhaps human values are so enormously complex, amorphous, irrational, relative, and generally intangible that any attempt at a scientific approach becomes hopelessly entangled from the start? To the scientist who likes to see order instead of chaos, certainty instead of myth, who wants to create a systematized body of knowledge and to understand causal and logical interrelationships—and perhaps do something about predicting and controlling the consequences—the field of human values certainly presents a considerable challenge.

Some fundamental points about the nature and origins of values are discernible, however, that do much to help prepare the way. First, values of the cognitive ideological sort that are of greatest concern for our present purposes are founded in hierarchical systems and subsystems that are goal-dependent. Given any desired goal, that which helps toward attainment of the goal becomes good and that which obstructs becomes bad. Similarly everything that helps to attain all the subsidiary things, which in turn help to reach the main goal, also becomes valued accordingly. A shift in the main goal may bring corresponding shifts—even reversals of value—throughout the whole associated hierarchy of subsidiary values.

It follows, further, that any concept or belief that is accepted regarding the goal and value of life as a whole will then logically super-

sede and determine values at subsidiary levels. This is why religion, and philosophy to a lesser degree, by postulating answers at the top levels thereby become an ultimate reference and authority for value judgments in general. Legal, moral, and other codes must conform, and, in case of conflict, deference is commonly given to a person's religious conscience and convictions. What is sacred gets special priority. Once a given answer regarding the goal or meaning of existence becomes accepted, value priorities then can be ordered and value issues judged accordingly. Whether the aim be a place in heaven, a suspended state of nirvana, progress of the "party," or whatever, the good life and the converse automatically crystallize out by logical inference from any accepted belief concerning the ultimate goal.

The focus here and throughout is on cognitive values at the ideological level because these are the values that are of major importance in the global chain of command. In the long-term, large-scale sociopolitical activities, cultural conflicts, and ideological power struggles that are of concern in today's crisis problems, these cognitive values embody and tend to supersede the more immediate, situational, irrational, and natural or biological values.

Social values are necessarily built in large part around inherent traits in human nature written into the species by evolution [5, 6]. These basic species traits were excellent for assisting evolution and survival through the Stone Age but become disastrous when combined with the overwhelming numbers and technological powers of modern man. The basic aspects of human nature and their direct value derivatives are treated here as constants in the total picture, to be accepted and worked with, rather than modified. Fortunately, the social consequences from values of this kind are subject to considerable regulation and control through the higher cognitive value systems on which we here focus. These are enforced, in turn, by man-made codes and written law. The value of staying out of prison, etc., may be utilized to control undesirable natural impulses. It is the man-made laws, written and unwritten, enforcing values of more cognitive origin, about which one can hope to do something. Thus the large "human nature" element in the value problem, and along with it much of the "irrational" aspect, is taken care of, if one can properly manage the supersedent systems of ideological values.

It is another fundamental of value theory that no final absolute proof can be advanced to support the values of one person or culture over those of another. The logical defense of any set of values will be

found to rest ultimately on some axiomatic concept for which there is no proof and which must be accepted on the basis of faith or as being self-evident. In this respect, values are like the laws of physics, mathematics, and geometry—they rest on basic axioms that are accepted without proof. Even values of the intuitive irrational variety may be shown at least to imply the acceptance of certain starting premises. It follows directly that the basic postulates or starting axioms on which any system of values is built are critical in determining the total structure of the system.

In connection with this relativity and goal-dependency of values, it must be remembered further that nothing has meaning in and of itself. A thing or concept is perceived and gets meaning and value only in terms of a background, a surround, something beyond or different from itself. Jumping ahead from these points, we find that it is postulates concerning the meaning and goal of life as a whole—postulates that have to be taken without proof—that in the last analysis stand behind most of those ideological and social values of tradition and culture that now obstruct progress in crisis areas. It is of no surprise from an engineering standpoint that basic postulates accepted without supporting evidence and located in a potent key position in a dominant control system should turn out to be the strategic flaw in the global chain of control.

The Ultimate Axioms

The diagnostic search for the root causes behind today's crisis problems [7] narrows progressively from the biospheric effects of human intervention generally, to the determining factor of human values, to values of the cognitive category, to focus finally on the starting ultimate axioms, explicit or implied, on which these cognitive values rest. It is these latter axioms that structure the social values that shape the written and unwritten codes that govern the human actions and decisions that in turn determine the future on planet Earth. Any consensus for change in the basic axioms in this chain of control—like a new Bill of Rights, a new set of Commandments, a revised Manifesto, an amended Constitution—promptly modifies the entire control structure.

An active approach to value problems can thus be narrowed very largely from a concern with values in general to a much more pointed and strategic effort directed at the fundamental guideline concepts and beliefs on which cognitive value systems are based. When these

ultimate concepts and beliefs are in error, then social values will be correspondingly out of line, and all the associated human endeavor will be misdirected accordingly. Many of the basic assumptions and beliefs that have long sustained human value systems in the past were formulated far back in history, promulgated in an intellectual climate in which it was supposed that the world was flat, the sun circled the earth, and the seat of the mind was in the liver. Creative growth and correction in the original concepts have been suppressed by the tendency of most institutionalized belief systems to demand that their fundamental axioms not be questioned. Application of the principles and approach of science in this area provides the best possible assurance that man's fundamental guidelines not go awry.

This is not to suggest that authority for values be turned over to scientists as individuals, but rather that values and value questions be opened to scientific inquiry and public examination in general, and in particular that the same rigorous principles demanded in reaching belief in science be applied also in the realm of values. This means, in essence, that in dealing with value questions the inner mental processes of the brain must regularly be forced to check and double-check with outside reality. This is the fundamental law underlying the scientific method—a point that seems simple but is sometimes overlooked in statements on the essence of science [8]. All the vast superstructure of technology and research, the rigorous quantification, order, and institutionalization of science visible to the layman, are merely elaborations that stem from this basic operating policy. It stipulates that in reaching conclusions, the workings of the brain, intuitive, rational, emotive, etc., are not to be trusted on their own but must be checked regularly to assure conformance with outside reality. The mind can reach belief by various routes; the route of science is distinguished by its rigorous demand that any beliefs must double-check with the empirical evidence. It is not necessary at this stage to presume to find final, absolute answers—only improved ones.

Concepts of Consciousness Are Critical

Doctrine regarding ultimate values is closely tied to beliefs about the properties of the human psyche or conscious mind and its relation to physical reality. Value codes based on reincarnation, "afterlife" or "other-world" existence, cosmic and/or divine intellect, immortality, and the like, all imply preconceived answers. So long as the nature of mind and the mind-body relation remained shrouded in mystery, the

spectrum of possibilities was almost unlimited. The whole problem of human values floated in a wide open sea of uncertainty where science could hardly get started and value systems of necessity had to be built on little more than intuition, revelation and faith.

Advances in the mind-brain sciences of the last few decades have very substantially narrowed the latitudes for speculation. In particular, the accumulating evidence in neuroscience builds up overwhelmingly today to the conviction that conscious mental awareness is a property of, and inseparably tied to, the living brain. This is something that modern science points to as a salient reality of our world that we now must face. Like the reality of evolution and the earth's rotation, this new knowledge of the neurosciences must be taken into account and our values and ultimate goals reshaped accordingly. A concept of mind and matter emerges [3, 4] that supports a unifying "this-world" view of man in nature as a framework for value guidelines. Perhaps more than any other single development, the advances of the last half-century in our understanding of the neural mechanisms of mind and conscious awareness clear the way for a rational approach in the realm of values. This is not to say that the problems of mind-brain relations are fully solved—far from it—but only that by process of elimination the range of realistic answers and their implications has been greatly reduced.

Regardless of whether the answers of today in this or other areas prove final, the all-important ground rule for a scientific approach is the demand for adherence to the empirical evidence, whatever its status. This excludes values based on other-worldly beliefs, any form of mystical insight, revelation, or unproven hypotheses about economics and class power struggles, however appealing these may appear to be. These limitations of the scientific way are at the same time its strength. Value-belief guidelines arrived at on these terms can be counted on to be protected from flaws of the kind that have become apparent in past mythologies.

Unlike tribes in the jungle or even whole cultures and nations in centuries past, modern civilized society with its magnified global impact is under pressure to choose its value guidelines with a new kind of care and wisdom, around something of a higher order than man's natural reactions toward self-preservation. A new transcendent frame of reference is needed that cuts across all cultures, faiths, and national interests for the welfare of the biosphere as a whole. Although this might eventually evolve spontaneously with time, an active focussed

attack with a strong assist from science could do much to speed the process. If science today would retain public confidence and support in a scene where value problems have become primary, it might be advised to reverse openly the century-old rejection of values as something outside its province. Few things could promise a more profound and widespread influence on the future at large than to bring together science and religion and other disciplines in a crash program on values.

Quality of Values Founded in Science

The question of practical procedure becomes a separate undertaking that calls for concerted effort of many leaders from different fields, exploring, conferring, debating, and communicating with feedback via channels that best reach and influence the public mind. Some further comment, however, may be helpful in response to the immediate doubts and questions that inevitably arise concerning the quality and kinds of values with which society might find itself afflicted on the above terms. How will values founded in science stack up in comparison with those obtained from other sources? Initial apprehension in regard particularly to spiritual richness and appeal seems to disappear largely upon exploration, provided the fallacies of scientific reductionism [6] are avoided.

Consider, for example, as a tentative starting baseline something like the following: "The grand design of nature perceived broadly in four dimensions, including the forces that move the universe and created man, with special focus on evolution in our own biosphere, is something intrinsically good that it is right to preserve and enhance, and wrong to destroy or degrade." From such an axiom defined strictly in terms that are scientifically sound, an extensive and coherent value-belief system can be constructed by logical deduction. Other axioms may be added as long as they are consistent. Once accepted, the starting axioms and their logical implications come to serve as ultimate standards of reference for value judgments at all levels. As with any new set of laws, bill of rights, etc., there will be considerable room for differences of interpretation, especially at the start. With time, trial and effort will bring consolidation and refinement of meaning. Acceptance at the outset, merely in general terms, however, would go far to remedy the current confusion in ethics and morality by providing a fundamental basis on which value issues can be decided and argument made meaningful.

The kind of value system that logically emerges from any such foundation will contain much in common with alternative systems based on other-worldly beliefs, intuition, or communist, Buddhist, or other doctrine. Significant fringe differences become evident, however, that are critical for current crisis problems. Ancient taboos, mythical beliefs, and a variety of cultural traditions, barbarisms, and sacred cows disappear as value determinants. A new perspective and new emphases emerge concerning issues relating to population control, pollution, plunder of the ecosystem, war, species' rights, and related questions.

Individual freedom of choice, flexibility, and diversity may be inferred for personal values as long as the subset personal values are not in overt conflict. Man would continue to occupy a top position of prime importance, and priorities for most of the higher qualities of human civilization would be preserved. Man would, however, in any system based in science, probably lose some of his former unique, absolute status as the one measure of all things. Human society would no longer be justified in destroying or downgrading the rest of the system for its own homocentric aims. A significant revision of value standards and general outlook also will be found to result from extending the basis for value judgments over the evolutionary time scale. Most of man's great value-belief systems of the past have been rather strictly human-oriented, on the one hand, and divine-myth-oriented, on the other. A more evolutionary long-term biospheric perspective is needed.

It may be noted that the "grand design" of the sample axiom includes, by definition, the trends of evolution. The upward thrust of evolution as part of the design becomes something to preserve and revere. This would imply a commitment to progress and improvement—not in the municipal chamber of commerce sense—but in terms of furthering the advancement of the evolutionary trend toward greater complexity, diversity, and improvement in the quality and dimensions of life and the life experience. A sense of purpose and meaning is thus provided for the life of the individual and for society as a whole, a critical feature of which involves furthering the evolution of human understanding of the natural order.

It is important to emphasize that a starting postulate of the sort illustrated, though based in science, is not an irreverent one. Reverence for the cosmic forces that control the universe and created man is retained in full; only the definition and conception are modified

to conform with modern evidence. Instead of relating to a single omnipotent personal control force, man would relate to a vast complex of forces, hierarchically interlocked from the subatomic through the cellular, organismic, social, and even galactic levels in a great pluralistic system of controls all differentiated from, and united in, a common foundation. Much of the great humanistic teaching of the past would be little changed in its basic impact by such an interpretational shift. The "grand design of nature" as seen through the expanding eyes of modern science would appear already in its present form to contain as much to sustain the highest in man's religious and spiritual experience as do some of the comparatively simple metaphysical schemes that have had wide acceptance. A scientific approach would not lead to a rigid, closed scheme but rather to one that would continue to unfold and enlarge indefinitely as science and understanding advance.

The practical consequences for action effected by a value shift of this kind can be seen to stretch out endlessly. Prevention of environmental pollution and ravishment of the ecosystem, for example, becomes more than a mere expedient for human benefit. The ultimate meaning and purpose of all life are at stake, and a corresponding conviction, conscience, and dedication come to reinforce the effort. Comparable changes are realized in respect to species rights, optimization of human population, nuclear escalation, and the like. Present trends to the contrary, humanity needs to see itself in terms of something greater and more important than itself to give meaning and purpose to human existence. The social system, commune, or all of humanity in general is not enough. With prior forms of metaphysical belief now widely rejected, something like the "grand design" of the sample axiom is needed.

It may be seen that science, on the above terms, acquires a social role above that of provider of better things for better living, or predictor and controller of natural phenomena, or even that of advancing knowledge. Science becomes a source and arbiter of values and belief systems at the highest level and the most direct avenue to an intimate understanding and rapport with those "forces that move the universe and created man."

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